

## Structural Diagnosis

All over the world, officials charged with preservation of historical structures are faced with a growing problem: environmental contamination of building materials that causes structural deterioration. A first requisite to preserving the structures is identification of the nature of the contaminants, such as salt or moisture. The conventional method of doing that is laboratory analysis of core samples of materials suspected of contamination. That method is used sparingly, however, because core sampling can damage the structures.

A "non-invasive" technique, based on space technology and capable of being carried out with commercially available equipment, has been developed and tested by a group of Maryland scientists: Dr. Jacob I. Trombka of Goddard Space Flight Center; Dr. Larry G. Evans of Computer Sciences Corporation (CSC), Silver Spring, Maryland; and Richard A. Livingston of the University of Maryland's Geology Department.

First used to analyze lunar soil, the procedure stems from NASA technology developed for on-site planetary exploration by unmanned spacecraft. It employs a neutron source and a gamma ray detector. Placed on one

side of the wall to be examined, the source fires neutrons created by the decay of a radioactive isotope. As they pass through the wall, the neutrons collide with atoms and the atoms—depending on their type—emit various kinds of gamma rays. These rays are identified by the gamma ray detector on the other side of the wall. The energy of the rays shows the kind of element present; the intensity level indicates the quantity. The composition of the contaminants within the walls is determined by a multichannel analyzer.

In the upper photo, CSC's Dr. Evans (left) is positioning the neutron source on one side of a demonstration wall while a University of Maryland graduate assistant positions the gamma ray de-

tector on the other side. In the lower photo, the university's Richard Livingston (left) and Dr. Trombka are using the multichannel analyzer to determine the nature of the contaminants within the wall.

The Maryland trio first tested the procedure successfully on an 18th century smokehouse in Colonial Williamsburg, Virginia. Subsequently, at the invitation of a group of Italian conservation scientists, they

used it to analyze contaminants at St. Mark's Basilica and Gradenigo Palace in Venice. The technique provided the Italians with their first solid information on conditions inside the Basilica's walls, which contain priceless mosaics.

The structural diagnosis procedure is still in an early stage of development. However, say its developers, "no major research and development is required before it can be used routinely." ▲

